

CLAIMS

- 1 1. A process for fabricating a heat sink, comprising:
2 providing a heat sink; and
3 treating the heat sink to a cryogenic quenching process.
- SP 1 2. The process of Claim 1 wherein the heat sink is fabricated from a metal alloy
BT 2 having precipitating constituents.
- CT 1 3. The process of Claim 1 wherein the heat sink is part of a microelectronic package
D 2 including a die affixed to a carrier substrate.
- 1 4. The process of Claim 1 further comprising prior to treating the heat sink to the
2 cryogenic quenching process first treating the heat sink to a temperature high enough to
3 lead to a secondary re-crystallization grain growth, which changes the microstructure of
4 the heat sink from a fine grain to a coarse grain.
- 1 5. The process of Claim 1 wherein the treating of the heat sink to the cryogenic
2 quenching process includes gradually lowering the heat sink to a cryogenic temperature
3 and then immediately raising the temperature of the heat sink.
- 1 6. The process of Claim 4 wherein the changing of the microstructure of the heat
2 sink from a fine grain to a coarse grain improves the thermal conductivity of the heat sink

3 by reducing the number of grain boundaries in the heat sink that obstruct the movement
4 of atomic and molecular species.

1 7. The process of Claim 1 further comprising affixing the heat sink to a
2 microelectronic die mounted to a package substrate.

1 8. A process of fabricating a heat sink, comprising:
2 providing a heat sink comprised of a metal alloy;
3 raising the temperature of the heat sink to cause a secondary re-crystallization
4 grain growth in the metal alloy; and
5 treating the heat sink to a cryogenic quenching process.

1 9. The process of Claim 8 wherein the metal alloy has precipitating constituents.

1 10. The process of Claim 8 wherein the thermal conductivity of the heat sink is
2 improved by changing the microstructure of the metal alloy from a fine grain structure to
3 a coarse grain structure.

1 11. The process of Claim 8 wherein the heat sink is fabricated from an aluminum
2 alloy.

1 12. The process of Claim 8 wherein the heat sink is fabricated from a copper alloy.

1 13. The process of Claim 8 further comprising affixing the heat sink to a
2 microelectronic die mounted to a package substrate.

1 14. A process of fabricating a heat sink, comprising:
2 providing a heat sink; and
3 expanding the grain structure in the heat sink from a fine grain to a coarse grain to
4 enhance the thermal conductivity of the heat sink.

1 15. The process of Claim 14 wherein the heat sink is fabricated from a metal alloy
2 with secondary re-crystallization grain growth.

1 16. The process of Claim 15 further comprising treating the heat sink to a cryogenic
2 quenching process by gradually lowering the heat sink to a cryogenic temperature and
3 then immediately raising the temperature.

1 17. The process of Claim 14 wherein the heat sink is part of a microelectronic
2 package which includes a die affixed to a package substrate, the thermal conductivity of
3 the heat sink improved by reducing the grain boundaries that obstruct the movement of
4 atomic and molecular species.